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THE DELAWARE RIVER

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The Delaware River is a great waterway which, one hundred years ago, furnished ample means of communication between the chief commercial city in America and the sea. Upon the banks of the Delaware were erected the great shipyards of the country. In colonial days, during the Revolutionary War, after the nation had been founded, and since that time, to and including the present day, the Delaware has been the American Clyde, and although commerce has been largely diverted to other ports than Philadelphia, the Delaware has remained the shipbuilding center of the Atlantic seaboard. But it has not continued to furnish ample means of communication between Philadelphia and the sea. That has been one of the reasons (but only one) why commerce has been diverted to other ports. When the ships of commerce drew no more than eighteen or twenty feet of water, they could reach the docks of Philadelphia through the natural waterway almost as readily as they could reach the docks of New York, but when the draft of merchant ships was increased to twenty-five, or thirty-five feet, shoals in the Delaware prevented access to the port at low tide and resultant delays compelled the larger and more economical ships to trade at ports where fewer obstructions were encountered.

Attempts have been made to remove the obstructions, thus restoring the conditions of equal competition under which Philadelphia was for a time the leading commercial city of the country, but in their results they have not kept pace with the growth in the size of merchant ships. The 30-foot channel in the Delaware is to be completed in June, 1908, but there is already urgent need for a 35-foot channel and before that can be completed a 40-foot channel will probably be required owing to the increase in the draft of vessels. The national government has done a great deal towards the improvement of the Delaware

River. Pennsylvania and Philadelphia have liberally supplemented the work of the Federal authorities, and yet much remains to be accomplished.

The importance of the work is not to be measured by the commercial interests of Philadelphia. The deeper channel is needed not only for the purposes of commerce, but to enable the great shipyards on the Delaware to send their products to the sea and to make available to the modern American battleship the greatest fresh-water naval station, dry dock, and repair shop on the Atlantic coast. The nation's interest in the improvement of the Delaware is superior to that of the City of Philadelphia, and will become a controlling interest if the deep waterway project should result in the construction of an interior line for the movement of battleships along the coast—a project of which the Delaware River will be the most important link.

Starting with the Delaware River as an adequate means of communication between Philadelphia and the sea, as it was a century ago, and indeed down to about 1850, let us see what has been done to improve it in order to keep measurable pace with the demands of commerce. The head of navigation is at Trenton, where natural falls limit the tidal flow. The river there is very shallow and no considerable depth is found north of Philadelphia. In front of the city there were flat islands which diverted the channel. From the city southward to deep water in the bay, bars, flats and rocky ledges obstructed the channel to some extent for considerable stretches, but even at these points the depth at mean low water was from seventeen to twenty feet, so that no great need for dredging operations appeared until after the Civil War. Here, as elsewhere, prior to 1867, few attempts were made to improve natural waterways except to meet local demands, and as a consequence the first efforts to improve the Delaware River were made on the river above Philadelphia. As early as 1836 the United States Government expended \$15,000 in making a channel through Perriwig bar, where the depth of water was originally only three to six feet. The next appropriations (1872 and 1873) were also for improvements in the upper Delaware where depths of only eight to nine feet have been obtained. Attention was then turned to the lower Delaware, and a little work was done each year, but a quarter of a century elapsed before appropriations were made large enough to do much more than maintain the natural channel.

In 1885 a board was convened to prepare plans for a channel from Philadelphia to the sea 600 feet wide and 26 feet deep; and in 1899 another board was appointed "to revise the plans for improving the Delaware from Trenton to its mouth." Several other boards have been convened to pass upon particular problems, and the work has been in charge of a dozen different engineers in the course of thirty-seven years. It is quite natural that under such administration, mistakes should have been made, plans changed, costly work sacrificed and less good accomplished than was expected. This was not necessarily the fault of the engineers, who until recent years were always hampered by insufficient appropriations. The Delaware has, nevertheless, been greatly improved. At only two places is there now a less depth than thirty feet at mean low water, and the thirty-foot channel from Philadelphia to the sea will be completed in June, 1908. From 1885 to 1899 all appropriations were applied to the 26-foot project, and since March 3, 1899, all appropriations have been applied to the thirty-foot project.

From 1836 to 1899 less than \$2,000,000 had been expended on the improvement of the Delaware, and the results accomplished were the forming of a channel not less than 7½ feet deep between Bordentown and Philadelphia, and of a channel not less than 20 feet deep between Philadelphia and the sea. In March, 1888, a resolution was approved providing for the appointment of a board of engineers to report upon the river between Philadelphia and Camden, and the report of this board led to a very great improvement of the harbor. The report recommended the forming of a deep channel 2,000 feet wide along the city's front at such a distance from the then wharf line as would permit an extension of wharves, and the widening of Delaware avenue. The plan involved the entire removal of Windmill and Smith's Island and their adjacent shoals and the cutting off of a part of Petty's Island. To accomplish this purpose the islands were bought at a cost, including legal expenses, of \$708,000, the state paying \$200,000, the City of Philadelphia \$208,000 and the national government \$300,000. A necessary part of the work was the extension of the wharves of Philadelphia and Camden so as to narrow the channel and produce the scour required for its maintenance. The city and the Girard estate greatly aided in this work, which was completely successful and brought about a marked improvement of the river front.

The river and harbor act of March 3, 1899, provided for the formation of a channel 600 feet wide and 30 feet deep to extend from Christian Street wharf, Philadelphia, to deep water in the bay, at an estimated cost of \$5,810,000. This marked the beginning of liberal appropriations for the improvement of the Delaware, and the contemplated work is now approaching completion. Besides its appropriations for harbor improvements, the City of Philadelphia has expended \$685,000 on improvements of the Delaware River, and in 1905 the State of Pennsylvania and city appropriated sums aggregating \$750,000 for dredging operations between Philadelphia and the state line.

The work of dredging undertaken by the city and the state would have been done in time by the Federal Government, but the purpose of city and state appropriations was to expedite the improvements. There was a strong desire to begin work this year on a 35-foot project, and to that end it was proposed that surveys be made at once and plans prepared for the new work. But, following precedent, the river and harbor committee refused to begin a new project until the 30-foot channel should be completed.

The present condition is that a channel 8 to 9 feet in depth has been established between Bordentown and Philadelphia, a channel not less than 26 feet deep along the city front, and a channel 30 feet deep from the lower part of Philadelphia to the sea. Under the 26-foot project the government expended nearly \$600,000 for dikes, and under the 30-foot project nearly \$1,000,000 for bulkheads. In 1829 work was begun upon the breakwater, and continued until 1898, at which time its cost had reached \$615,036. In 1897 the National Harbor of Refuge was begun, and up to 1901 near two and a half million dollars had been expended on this project. In addition to all this, the government has provided an excellent system of lighting the river.

The expenditures by the United States Government on account of improvements to the Delaware River, including the Delaware Breakwater and the Harbor of Refuge, have amounted to nearly \$12,000,000. Philadelphia and Pennsylvania have added \$1,500,000 to the expenditures for deeper waterways alone. More than one-half of the whole amount has been spent on the 30-foot project, from which it appears that the bulk of the work has been done in the last five years.

The Schuylkill River, the chief tributary of the Delaware, runs through the city and empties into the Delaware at the lower end of the city. It is navigable for only a few miles, but is a stream of great importance to the commerce of the city. League Island, which was presented by the city to the government to be used as a naval station and navy yard, is a large island at the mouth of the Schuylkill. Here the government has spent millions of dollars in reclaiming land, in the construction of work shops, in the building of a great dry dock, recently completed, and in dredging operations. It has treated the Schuylkill, however, as a local stream, except for its own purposes, and the improvement of that river, which is capable of being made an important factor in the commerce of the port, will probably have to be done at the expense of the city and state. The government, however, may aid to keep the mouth of the Schuylkill open for vessels of large draft, for the naval station at League Island is capable of being made one of the finest in the world. It is secure from attack, surrounded by fresh water, and within the limits of a great city which can at any time supply an army of skilled workmen and supplies of all kinds, for making repairs or building ships.

The one defect, the want of a channel to the sea sufficiently deep to float the larger vessels of the navy, will be removed by the completion next year of the 30-foot channel, for the rise of tide in the Delaware is six feet, and by taking advantage of the tides vessels drawing more than thirty feet can reach the city. In time of peace, naval vessels can afford to wait for the tide, but there are few that cannot now reach League Island at any stage of water. It is, of course, desirable that the channel should be further deepened, first to thirty-five feet and then to forty, because merchant ships cannot afford to be delayed; but for uses of the navy, the Delaware now meets ordinary requirements.

As a link in the chain of deep water ways from Boston to Beaufort, the Delaware is of first importance. Its 30-foot channel from Philadelphia to deep water in Delaware Bay will be ample until other links in the chain have been completed and by that time it will have been further deepened. The proposed Delaware and Chesapeake ship canal will at once put Philadelphia in communication with numerous important points on Chesapeake Bay and its tributaries. The extension northward to Raritan Bay involves

not only the building of a ship canal, but extensive improvements in the river itself, for the channel north of Philadelphia is only nine feet deep the greater part of the way to Bordentown. Southward from Philadelphia to whatever point may be selected as the outlet to the Delaware and Chesapeake Canal, the Delaware River is already an ample water way for the purposes of the proposed continuous inland route. The immediate demand is for the completion of the 30-foot channel from Philadelphia to the sea; then for a survey for thirty-five feet which is necessary to accommodate vessels of increased draft. The 30-foot channel is now assured, and it is believed that an awakened public sentiment will soon induce Congress to grant the survey for the additional five feet. All signs point to an improvement in the conditions surrounding the Delaware River. New Jersey, Pennsylvania and Delaware are aroused to the importance of developing the stream for enlarged navigation, and the naval authorities are interested because of the great public value and strategic importance of the fresh water repair station at League Island.